

REMARKS

Claims 19-32 were pending.

Claim 21 is cancelled.

Claims 19-32 are rejected.

Claims 19, 22, 23, 30 and 31 are amended.

Claims 33-41 are new.

Claims 19-20 and 22-41 are pending.

Amended Claims 25

Claim 25 is amended to clarify the antecedent basis.

New Claims 33-41

Claim 33 is a new independent process claim directed to a process similar to claim 30, however the an irradiation exposure step is added and the exposing irradiation is from ultraviolet laser or ultraviolet lamp radiation of 285 to 400 nm, electron radiation, X-ray or gamma radiation.

Support for claim 33 can be found in claim 30 and claim 32.

Claims 34 thru 41 depend from claim 33 and are analogous to the claims 20, 22-29 which depend from claim 19. Support for claims 34-41 resides in claims 20 and 22-29 respectively.

No new matter is added.

The fee for two new dependent claims is enclosed.

35 USC 112, second paragraph

Claim 25 are rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants have amended as explained above.

Applicants believe this clarifies claim 25 and overcomes the 112, second paragraph rejection.

35 USC 103(a)

Claims 19-20 and 22-30 are rejected under 35 USC 103(a) as obvious over Fujikawa, US 5,698,373.

US 5698373 describes a photocurable composition, which forms a layer upon irradiation.

Accordingly, the essential ingredients of a composition according to US 5698373 are compounds, which are ethylenically unsaturated, i.e. monomers for the targeted photopolymerisation (-> column 3, lines 21-58). Furthermore, base resins can be employed as further building blocks to support the formation of the layer (-> column 3, lines 59-67).

A photopolymerisation initiator is also essential, i.e. starting the formation of the layer by generation of radicals under actinic irradiation (-> column 4, lines 1-15).

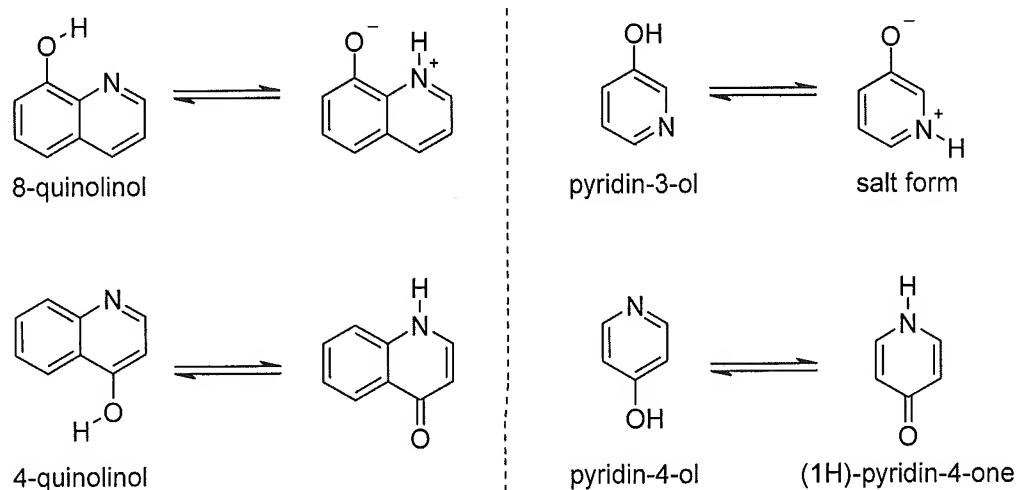
The dye precursor is the third essential component, i.e. formation of the coloration via formation of dyes under irradiation (-> column 5, lines 16-36).

The art skilled know that the dye precursors of said structures, also called colorformers, only transform into dyes under actinic irradiation, if a so-called color developer is also present. This colordeveloper is clearly the photopolymerisation initiator. This is clear from the disclosure which teaches that too high an amount of dye precursor deteriorates the photocurability, '... because a considerable portion of the radical actinic light is consumed for the formation of a dye.' (-> column 4, line 43). The art skilled know that this refers to the active species generated by the photopolymerisation initiator molecules are consumed on a molecular level in a one-to-one ratio by the dye precursor molecules instead of being able to act catalytically as radical chain starters for the polymerization reaction of the monomers, i.e. finally the mechanical formation of the layer. Indeed, the weight ratio between photopolymerisation initiator and dye precursor is in all examples 1-5 of US 5698373 at least 4.1 to 1.5 (-> example 4) but typically 5 : 1 or higher. Taking into account the higher molecular weight of the dye precursors in regard to the photopolymerisation initiators, the molecular ratio is at least around 6 : 1.

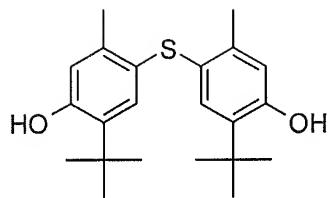
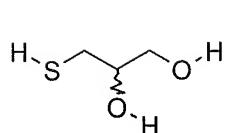
Further the person skilled in the art understands that the photopolymerisation initiator is the color developer. Note that in examples 1-2, no further additives are added – especially no phenolic type of compound.

A further preferable ingredient in a composition according to US 5698373 is a dark coloration preventing agent (-> column 5, lines 6-29). This seems to be special additives, which are structurally rather divers. In the case that these dark coloration agents are of the phenolic type of molecules like hydrochinone and para-aminophenol, there is the warning that '... the addition of these stabilizers often inhibits the photocuring reaction.' (-> column 5, line 22). Accordingly, US 5698373 recommends to use either quinolinol or a thiol compound (-> column 5, line 30). Indeed in the example 3, a relative low amount of 8-quinolinol is added to improve the storage stability over 5 months (-> column 9, line 28). In the example 4, 4-quinolinol is added in a relative small amount to improve the dark storage stability for six months (-> column 10, line 7). In the example 5, 8-quinolinol and thioglycerin are added to improve dark storage stability for two weeks (-> column 10, line 58).

A person skilled in the art knows, that said 4- and 8-quinolols are not typical phenols due to the possible tautomerism to either amide derivatives or salt derivatives like in the pyridinol cases. The tautomerism equilibrium constants depends highly on the molecular environment respectively medium, in which the heterocyclic hydroxyl derivatives are embedded.



Furthermore, thiols like thioglycerin are different to thioether like 4,4'-thio-bis-(3-methyl-6-t-phenol).



Accordingly, US 5968373 does not disclose the presently claimed composition, especially not a combination of dye precursor with a phenolic antioxidant or phenolic UV-absorber according to the present application. Nor does US 5968373 teach the presently claimed method wherein component (a) may function as the color developer when the matrix polymer containing both (a) and (b) is exposed to irradiation from ultraviolet laser or ultraviolet lamp radiation of 285 to 400 nm, electron radiation, X-ray or gamma radiation.

US 5698373 mentions as a large amount of further possible ingredients such as antioxidant.

- sulfur-based antioxidants, comprising sulfur atoms in all type of valent bond situations like thioether, thiol, dithiocarbonate and thiourea (-> column 6, lines 29-38)
- phosphorous-based antioxidants, comprising phosphites and thiophosphites (-> column 6, lines 39-46)
- phenol-based antioxidants (-> column 6, lines 47-50)
- benzotriazole-based antioxidants (-> column 6, lines 60-61)
- furan-type heterocyclic compounds (-> column 7, lines 8-46)
- aromatic carboxylate esters possessing a hydroxyl group adjacent to the aromatic group, i.e. another class of phenols though some listed representatives thereof do not fall under that definition like para-hydroxybenzoate (-> column 7, lines 47-58)

Out of these options, the phosphorus- and sulfur-based antioxidants are preferable (-> column 6, line 60).

However, the person skilled in the art reads further that these substances '... together with a quinoline compound will effectively prevent the dye precursor ... from developing color ...' under non-irradiation conditions (-> column 6, line 62). Therefore, there is no hint that any of these substances can be used with a dye precursor on their own for developing color and – as outlined above – the color developer role is therefore clearly with the photopolymerisation initiator.

In summary, there is no teaching in US 5698373 that a phenolic substance according to the present application together with a dye precursor is sufficient to develop color. But that is exactly the non-obvious finding in the present application: a phenolic antioxidant or a UV-absorbing phenolic compound is sufficient to act as color developer for a dye precursor under irradiation.

Especially in regard to the method claims 30 and 33:

Applicants point out that each of the examples contains no conventional color developers (photoinitiators or color developers as disclosed in US 5,824,715). The primary components are matrix polymer with (a) and (b). Nevertheless, color is produced when the composition is exposed to irradiation from ultraviolet laser or ultraviolet lamp radiation of 285 to 400 nm, electron radiation, X-ray or gamma radiation.

This is very surprising in light of Fujikawa and thus unobvious in light of Fujikawa.

Claims 19, 20, 22-24 and 32 are rejected under 35 USC 103(a) as being unpatentable over Yoshida, US 4,431,769.

Examiner believes Yoshida to disclose light sensitive recording paper (col. 5, lines 17-22). However, applicants believe the examiner has read too much into this alleged suggestion by Yoshida.

What Yoshida actually teaches is that the binder may be the same as that used in the preparation of ordinary coated papers such as art paper and coat paper, and in a coating material for the preparation of heat-sensitive recording paper, magnetic recording paper, light sensitive recording paper and the like.

It is clear throughout all of Yoshida's disclosure that his invention is directed to heat sensitive paper and not to light sensitive recording paper. Yoshida only refers to light sensitive recording paper to suggest that the binder may be same. Yoshida does not teach any light sensitive compositions at all which include the 2,2'-methylene bis (4-methyl-6-tert-butyl phenol).

The examiner believes the limitations that the polymer material is in the form of a fiber, textile, nonwoven or film and is contained on or visibly below the surface of a protective clothing, mask or irradiation indicating tag and "said protective clothing, mask or irradiation indicating tag undergoes an

irreversible change upon exposure to irradiation are merely intended uses and add no patentable weight to the claim.

Applicants disagree. A preamble limits the invention if it recites essential structure or steps, or if it is "necessary to give life, meaning and vitality to the claim. Furthermore, the dependence on a particular disputed preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention.

This is true in the present case. The structural limitations in the preamble are "in the form of a fiber, textile, nonwoven or film is contained on or visibly below the surface of a protective clothing, a mask, or an irradiation indicating tag. The phrase "protective clothing, mask or irradiation indicating tag" appears again in the body of the claim. Thus indicating that the preamble is essential to understanding the limitations of present claims; that is that the polymer material is a protective clothing, mask or irradiation indicating tag.

Claims 19-20 and 22-32 are rejected under 35 USC 103(a) as being unpatentable over Hayashihara, US 5,824,715 in view of Yoshida, US 4,431,769.

Examiner and Applicants agree that Hayashihara does not disclose phenolic type compounds encompassed by the presently claimed structure of compound (a).

To make up for this deficiency the examiner has combined Yoshida to provide a phenolic compound, such as 2,2' methylene-bis (4-methyl-6-tert-butyl phenol. According to the examiner, Yoshida shows that 2,2'-methylene bis (4-methyl-6-tert-butyl phenol) may be used as color developer for fluoran dyes, thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use 2,2'-methylene bis (4-methyl-6-tert-butyl phenol) as color developer in the composition of Hayashihara, with a reasonable expectation of success.

Applicants respectfully disagree:

Hayashihara teaches various phenolics and as agreed by the examiner none meet the present claim limitations.

Hayashihara teaches that the leuco dye and color developer should have a low solubility in toluene and that his "invention has been attained on the basis of this finding." See col. 2, lines 10-14.

Hayashihara defines low solubility in toluene for the color developer as one whose solubility in toluene at 65 °C is 10,000 ppm or below.

Examiner believes it to be obvious to replace the color developers taught in Hayashihara with the 2,2'Methylene bis(4-methyl-6-tert.butylphenol).

However 2,2'Methylene bis(4-methyl-6-tert.butylphenol) is **highly** soluble in toluene.

The applicant attach a MSDS for 2,2'Methylene bis(4-methyl-6-tert.butylphenol) from Baytech Global and related web document web address confirming this fact.

http://baytechglobal.com/Butylated_compounds/butylated_compounds_1.htm

Applicants point out that the enclosed product data sheet indicates that 2,2'-methylene bis 6-tert. Butyl-4-methyl phenol) have a solubility in toluene of ~62.0 g in 100 grams at 20° C.

As the toluene solubility of the color developer of Hayashihara is a critical factor acknowledged by Hayashihara, it would not be reasonable to replace the slightly toluene soluble color developers of Hayashihara with the highly toluene soluble 2,2'Methylene bis(4-methyl-6-tert.butylphenol). This replacement would lead to an inoperative invention and one which according to Hayashihara would not be successful.

Thus the applicants respectfully request that the 103(a) in light of Hayashihara and Yoshida be withdrawn.

Applicant submit that at a minimum claims 30-31 and 33-41 are allowable as the only rejection present to the method claim 30 and dependent claims resided in the combination of Hayashihara in view of Yoshida. As explained above this combination of references does not work and has been overcome.

Reconsideration and withdrawal of the rejection of claims 19-20 and 22-30 is respectfully solicited in light of the remarks and amendments *supra*.

Since there are no other grounds of objection or rejection, passage of this application to issue with claims 19-20 and 22-41 is earnestly solicited.

Applicants submit that the present application is in condition for allowance. In the event that minor amendments will further prosecution, applicants request that the examiner contact the undersigned representative.

Respectfully submitted,



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Enclosure: MSDS for 2,2"-methylene-bis (4-methyl-6-tert.-butyl phenol), additional claim fee and one (1) month petition for extension of time.